

Astročásticová témata na SLO

Ladislav Chytka za Astročásticovou skupinu SLO

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Zapojení SLO do projektů

Pierre Auger Observatory (Malargüe, Argentina)

Fluorescence Array of Single-pixel Telescopes / FAST (Malargüe + Utah, USA)

Cherenkov Telescope Array / CTA (La Palma, Španělsko + Chile)

Southern Wide-field Gamma-ray Observatory / SWGO (Jižní Amerika)

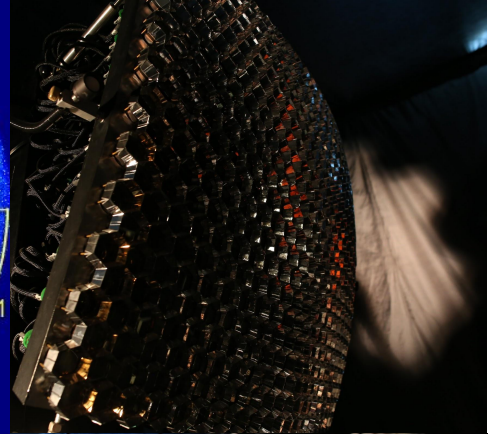
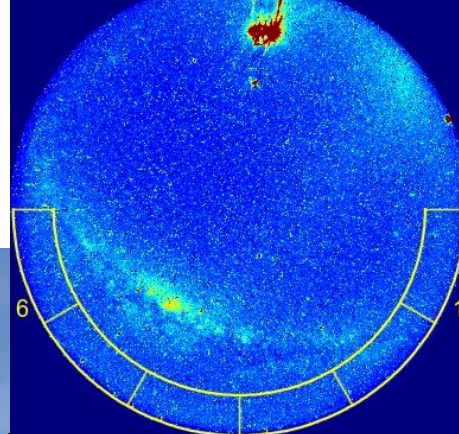
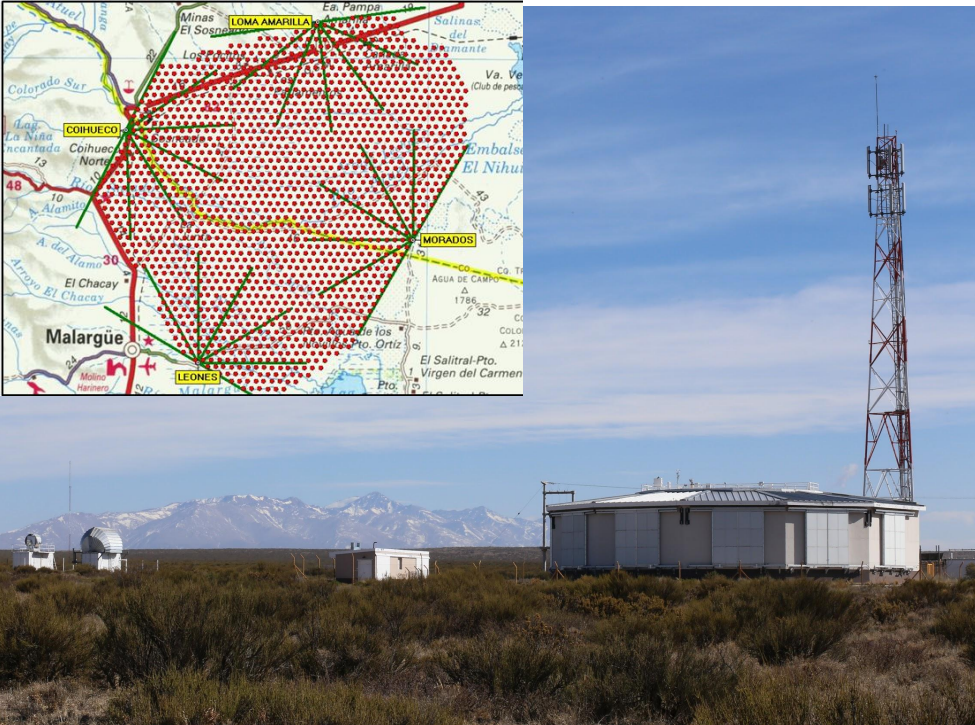
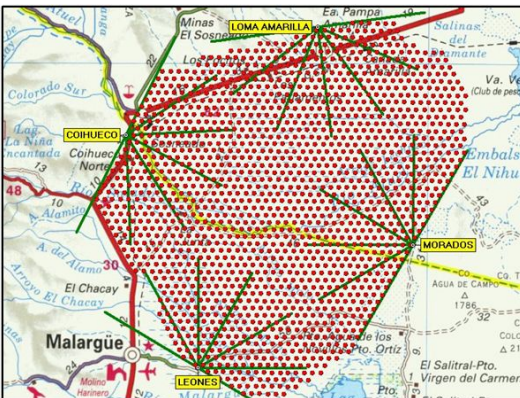
Probe of Extreme Multi-Messenger Astrophysics (POEMMA)

SST-1M

Optika, instrumentace, simulace, analýza dat
Zahraniční spolupráce

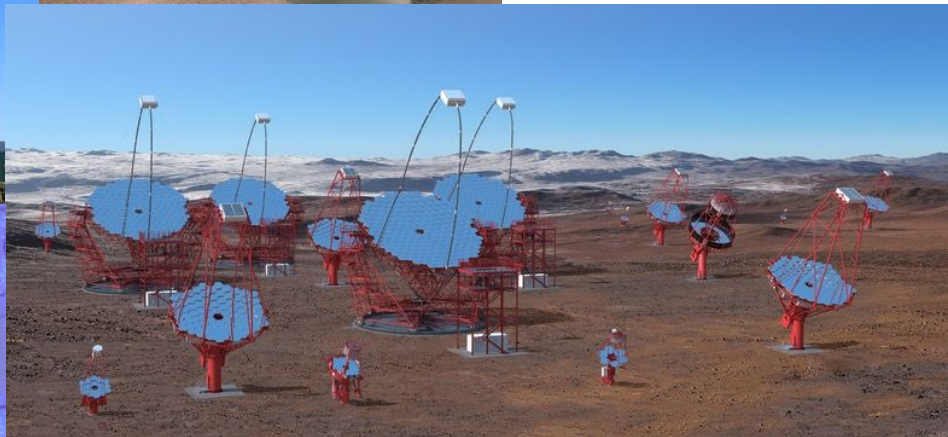
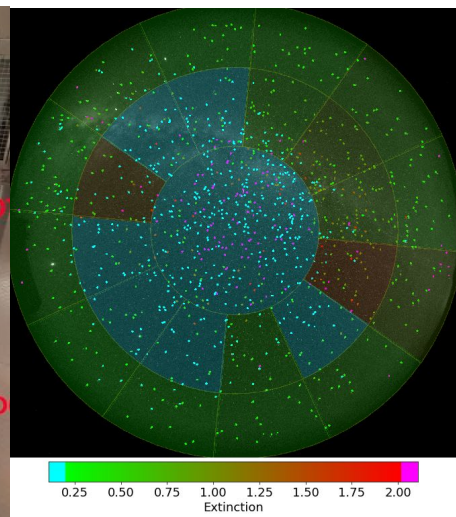
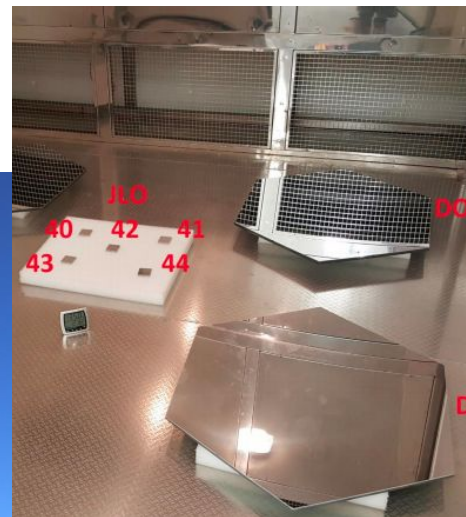


Observatoř Pierra Augera



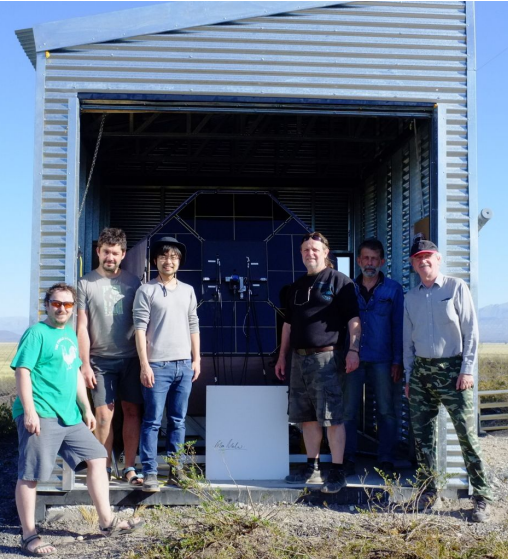
FD a jejich kalibrace, celooblohové kamery, analýza dat

Cherenkov Telescope Array

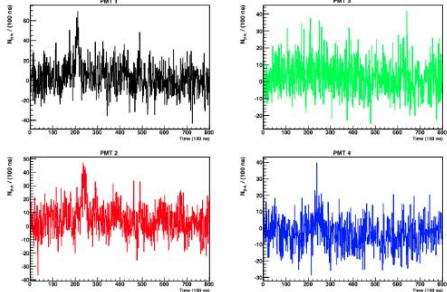


Optické simulace, testování zrcadel, monitorování atmosféry, LST commissioning, analýza dat

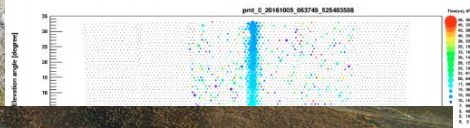
FAST



① 2016/10/05 06:37:49.525424540

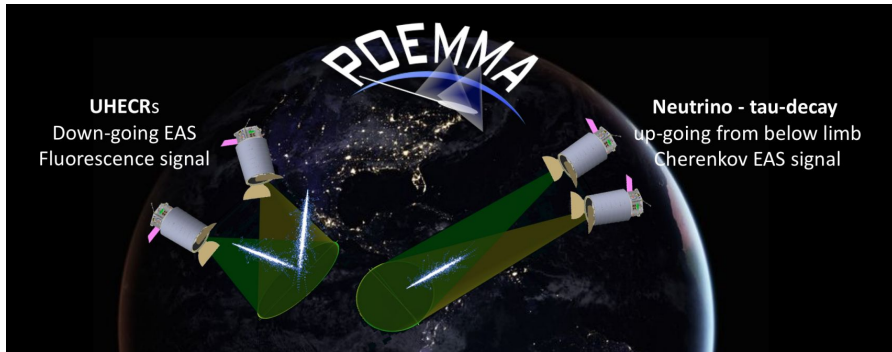


TAFD reconstruction
 $\log E = 18.08$, $R_p = 2.40$ km



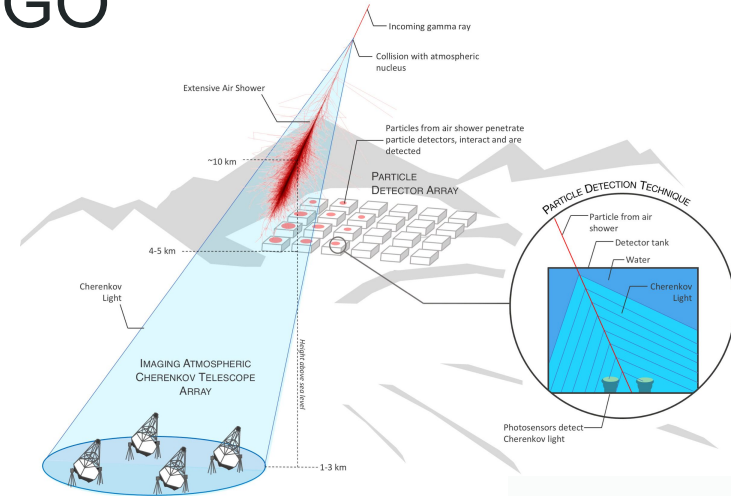
Optika a mechanika, slow control, atmosféra, provoz prototypů, kalibrace, simulace, analýza dat

POEMMA + EUSO-SPB

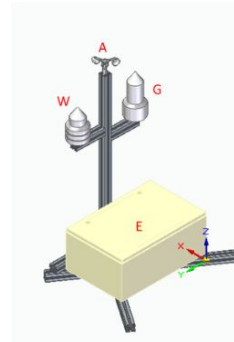
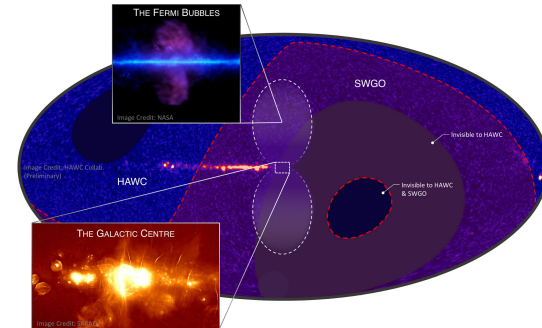


Optika, simulace

SWGO



Shower image, 200 GeV only adapted from F. Schmidt, J. Knapp, "COSMKA Shower images", 2005, <https://www.astron.de/~sknapp/ku/showerimages.html>

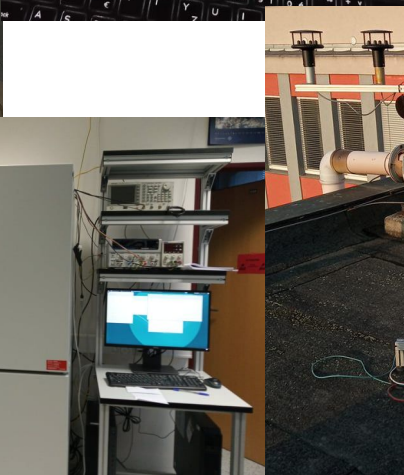
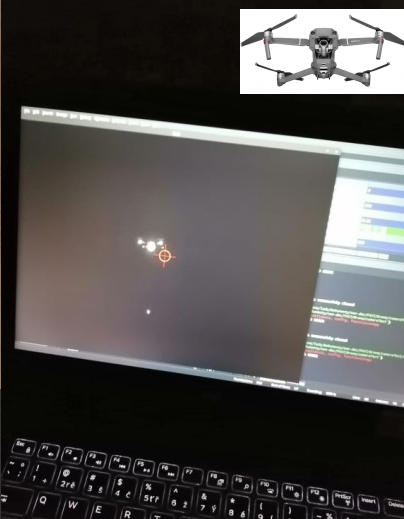
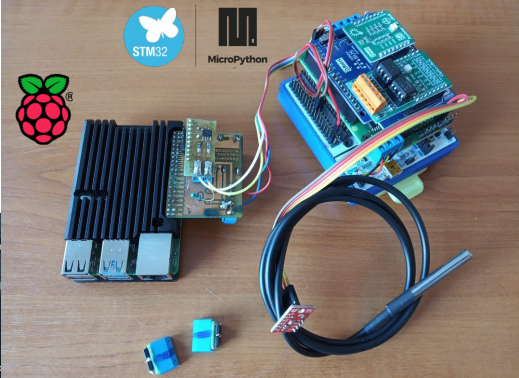


Vyhodnocení kandidátských míst

Náplň práce

```
File Edit Search Source Run Debug Consoles Projects Tools View Help
/home/lada/Dokum
Project explorer
a2zssh
beacon.py
create_ssh_tunnel.sh
dhcpcd.conf
moveFiles.py
opcGetBias.py
opcGetDark.py
opcGetTest.py
parallelRenameFilters.py
plotRecons.py
renameFilters.py
runBias.sh
set_ip_at_boot.sh
set_ip.sh
twoCameras.py
twoCamerasAnalysis.py
alarm.mp3
analysis.py
bganalysis.py
catSvc_max
catNames.py
config_default.py
config.py
flz2map.py
flipfits.py
functionsAnalysis.py
functionsFITS.py
functionsGx.py
functionsHTML.py
functionsImage.py
getImage.py
image-20151015-232817.fits
image-201910105-233644.fits
libgcc.so
mat2fits.py
mat2fits1.py
matplotlibrc
mysql_credentials.conf
mysql_fillCat.py
opcClient.py
opcServer.py
parallelAnalysis.py
parallelMax2fits.py
poi_defaults.tsv
poi.tsv
README
runAll.sh
runAnalysis.sh
runG2.py
runOPCClient.sh
runOPCServer.sh
simbad.tsv
starRatio-20191005
testG2.py
testOverlay.py
```

```
106 pol = np.polyid(p1xf1tCoefs)
107 return pol(x)
108
109 # return pixel distance to another star
110 def p1xDist(self, star):
111     return np.sqrt((self.p1xCal-star.p1xCal)**2+(self.p1xYCal-star.p1xYCal)**2)
112
113 # find the star in the image with reduced background
114 def f1ndStarPos(self, IwInBG):
115     # Epslon - epsilon neighbourhood of where the star should be (epsilon=4 is 7x7)
116     epsilon = 4
117     subImg = IwInBG[int(self.p1xYCal)-epsilon:int(self.p1xYCal)+epsilon], int(self.p1xCal)-epsilon:int(self.p1xCal)+epsilon)
118     bwImg = getBWImg(subImg)
119
120 # reset flags -- needed for repeated stars search
121 self.isDet = False
122 self.isSat = False
123
124 # find 4-connected areas
125 [n,I_stats,cen] = cv2.connectedComponentsWithStats(bwImg, 4, cv2.CV_16U)
126
127 # if there is at least one area
128 if(n>0):
129     # calculate total intensity in each found area
130     PV = []
131     for i in range(1,n):
132         PV.append(sum(I_stats[(I==i)*subImg]))
133
134     n_max = PV.index(max(PV))
135
136 # find local coordinates of the brightest pixel within the area with max intensity
137 maxArea = (I==n_max)*subImg
138 maxCoords = np.unravel_index(maxArea.argmax(), maxArea.shape)
139 # calculate the coordinates in the all sky image (the sub-image coordinates)
140 p1xDet = int(self.p1xYCal)+maxCoords[1]-epsilon
141 p1xYdet = int(self.p1xYCal)+maxCoords[1]+epsilon
142
143 global vykreslent
144 if(vykreslent):
145     print('Processing star *%s'*(self.starID))
146     print(self.p1xCal, self.p1xYCal)
147     showImage(subImg)
148     print(p1xDet, p1xYdet)
149     print(maxCoords[1], maxCoords[0])
150
151 rs = np.sqrt((maxCoords[1]-epsilon)**2+(maxCoords[0]-epsilon)**2) # distance from expected position
152 # center the sub-image to the found star position
153 subImg = IwInBG[p1xDet-epsilon:p1xYdet+epsilon, p1xDet-epsilon:p1xYdet+epsilon]
154
155 ##### Calculation of I and III using openCV #####
156 # get possible distances from center
157 radii = range(int(np.ceil(np.sqrt(2)*epsilon)))
158
159 # calculate intensities for circles with different radii
160 I = [] # intensities on given circle (non-filled) divided by num. of pixels
```



Programování, zpracování dat, laboratorní měření, testy elektroniky, mítinky

Témata prací

Analýza kosmického záření gama v experimentu CTA

Školitel: RNDr. Karel Černý, Ph.D., karel.cerny@upol.cz

Kosmické detektory částic

Školitel: Mgr. Jiří Kvita, Ph.D., jiri.kvita@upol.cz
Konzultant: RNDr. Karel Černý, Ph.D., karel.cerny@upol.cz

Soulad měření složení kosmického záření ultra-vysokých energií

Školitel: Ing. Jakub Vícha, Ph.D., vicha@fzu.cz
Konzultant: RNDr. Petr Trávníček, Ph.D.

Justáž a kalibrace astročásticových teleskopů pomocí dronu

Školitel: Ing. Ladislav Chytka Ph.D., ladislav.chytka@upol.cz

Simulace a analýza dat z atmosférických spršek kosmického záření pro detektor FAST

Školitel: Mgr. Petr Hamal, Ph.D., hamal@fzu.cz
Konzultant: Mgr. Jiří Kvita, Ph.D., jiri.kvita@upol.cz

Provoz a kalibrace prototypu astročásticového experimentu FAST

Školitel: Ing. Ladislav Chytka, Ph.D., ladislav.chytka@upol.cz
Konzultant: Mgr. Dušan Mandát, Ph.D., dušan.mandat@upol.cz



Děkuji za pozornost